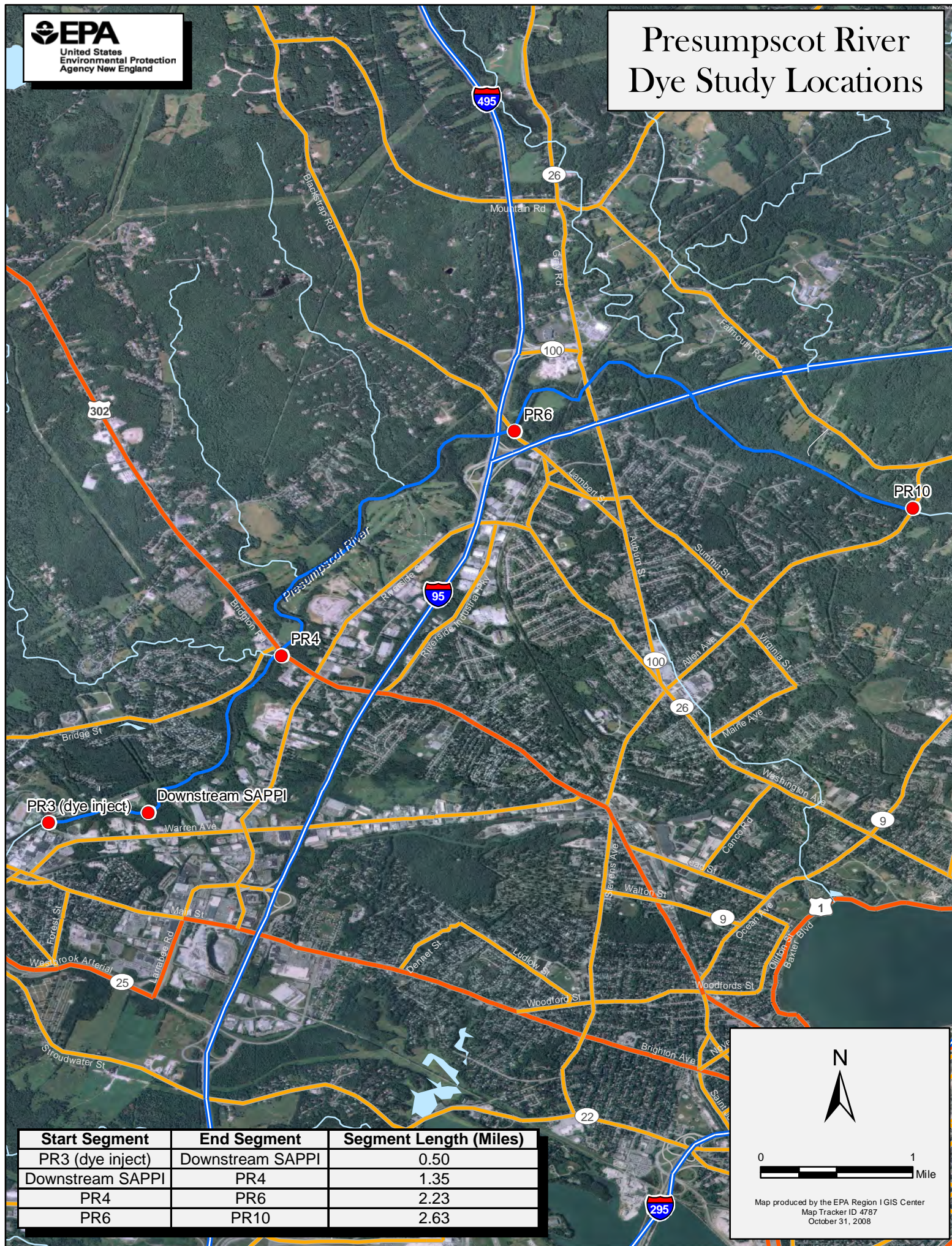


Presumpscot River Dye Study Locations



Presumpscot River Dye Studies

Westbrook, Maine Area

QAPP

During Low Flow Conditions in 2008

Project Work/QA Plan Acceptance



Tim Bridges

EPA Project Officer, EPA/OEME/ECA



Date



Steve DiMattei

EPA QA Officer, EPA/OEME/EQA

08-28-08

Date

Don Albert

MEDEP TMDL Coordinator

Date

TABLE OF CONTENTS

	<u>Page</u>
1.0 Project Objectives	3
2.0 Materials	3
3.0 Data Usage	4
4.0 Design and Rationale	4
5.0 Field Sampling	6
6.0 Interference and Potential Problems	7
7.0 Sample Handling	8
8.0 Analytical Parameters	8
9.0 Schedule of Tasks and Products	8
10.0 Field Safety	8
11.0 Data Quality Requirements and Assessments	9
12.0 Final Report	10
13.0 Reconciliation with Project Goals	10

TABLES

TABLE 1: Project Organization	3
TABLE 2: Station Locations: Presumpscot River	7
TABLE 3: Analytical References and QC Goals for Water	8

APPENIXES

Locational Map of Study Area	A
------------------------------	---

1.0 Project Objective

The Maine Department of Environmental Protection (MEDEP) has requested EPA, Region 1, Office of Environmental Measurement and Evaluation's (OEME) assistance in conducting a dye study in the Westbrook, Maine region at the Presumpscot River from the Westbrook/Windham border to head of tide in Portland, Maine. The results of these studies, in conjunction with physical and chemical measurements provided by MEDEP water quality sampling will give MEDEP data to model the Presumpscot River in this area. The MEDEP TMDL coordinator will use the data to verify flows and to redo the 1998 EPA approved TMDL report for the river. The TMDL will be adjusted to compensate for the October 2002 removal of the Smelt Hill Dam. Further, the data may be used to develop a model application that may be utilized to better understand other impaired waters in New England. Parts of the Presumpscot River are on the 2006. MEDEP 303(d) impaired waters list. The Presumpscot River basin is a concern to MDEP due to FERC relicensing and water quality issues.

In this study, a time-of-travel and dispersion will be used to better understand the flow during steady state near low flow conditions. A tracing fluorescent dye marker tracer system (Rhodamine WT) will be used to provide accurate on-site measurements. Dye will be slug injected with intensive measurements taken utilizing a discrete cell Turner Designs Fluorometer. This time-of-travel and dispersion study will be used to map out dispersion and dilution patterns of the Presumpscot River during low flow.

A dye release will be scheduled on the Presumpscot River when flows at the dam at the outlet of Sebago Lake are set for 250 cubic feet per second (CFS), which is approximately 3 times 7Q10. This level will be set at the Head Dam at the outlet of Sebago Lake. The level is controlled by SAPPI Paper in Westbrook. SAPPI is scheduled to set the level to 250 CFS beginning August 29th for a period of seven days. This will allow steady state conditions to exist for 4 days prior to the commencement of the study on Tuesday September 2nd.

Table I, Project Organization

PROJECT HIERARCHY				
<u>MEDEP</u> <u>Project Officer</u>	<u>OEME</u> <u>ME</u> <u>Coordinator</u>	<u>USEPA</u> <u>QA</u> <u>Officer</u>	<u>USEPA</u> <u>Project</u> <u>Officer</u>	<u>Field</u> <u>Activities</u>
Don Albert	Tim Bridges	Steve DiMattei	Tim Bridges	USEPA

2.0 Materials

FLUOROMETER TRAIN

- ☐ 10-AU-005 FLUOROMETER DISCRETE CELL W/ BACKUP
- ☐ AC POWER CABLE
- ☐ 125 ML HDPE BOTTLES (100)

GENERAL FIELD SUPPLIES

- ☐ Rain jacket, sunscreen, Cell Phone, logbook, camera
- ☐ Waders
- ☐ IMPORTANT phone #s

DYE INJECTION

- ☐ CONCENTRATED DYE
- ☐ CONCENTRATED DYE
- ☐ 5 GALLON PAIL (2)
- ☐ GRADUATED CYLINDERS FOR DYE
- ☐ SUPPLIES
 - PAPER TOWELS - GLOVES - TYVEK SUITS - BOOTIES
 - BLEACH (1 GAL) - LOGBOOK - CAMERA
 - HAND CLEANER - EXTRA TAP WATER (5 GAL)

ISCO DISCRETE SAMPLER

- ☐ 4 ISCO Model 6700 or 2700 w/ Discrete Base
- ☐ Extra Discrete Base
- ☐ 500ml grad. cylinder
- ☐ Charged Batteries
- ☐ Tygon Tubing, Silastic Tubing
- ☐ Lock and chain
- ☐ Strainer, Hose clamps, rope, gloves, scissors
- ☐ DEIONIZED WATER (5 gal)

3.0 Data Usage

Data will be used in conjunction with water quality data collected by MEDEP to determine classification of the Presumpscot River.

Results Usability/ Interpretation

Fluorometric analysis will be reviewed as to the quality and usability of the data by the field QA Officer and the EPA Project Officer. MEDEP TMDL coordinator will provide an interpretation of data.

4.0 Design and Rationale

This project will take place in an effort to locate time and dispersion of dye concentrations at 4 stations throughout the Sandy River and 6 stations throughout the Wilson Stream. Sampling locations will in part be based on accessibility and recent TMDL Water Quality sampling locations. Each sampling location will be

documented through the use of Global Positioning System (GPS) to produce accurate sample locations when plotted on a Geographic Information System (GIS) maps. Tables and maps will consist of leading edge, and peak dye concentrations at each station.

Dye Injection Sandy River

Crews will dilute 1000 ml of concentrated dye with 4000 ml of river water to 5000 ml of diluted dye. Crews will then slug inject the dye below the RT42 Bridge in Farmington. Field crews will distribute diluted dye in a 5-gallon pail and ensure dye is well mixed before initial concentrations are determined in the river.

Dye Injection Wilson Stream

Crews will dilute 1000 ml of concentrated dye with 4000 ml of river water to 5000 ml of diluted dye. Crews will then slug inject the dye at the River Meadow golf club river access. The dye will distribute diluted dye in a 5-gallon pail and ensure dye is well mixed before initial concentrations are determined in the river.

Tracking the Dye

Dye will be tracked by grab sampling at locations downstream near the injection point and ISCO discrete samplers along side the river at times when crews are not able to grab samples.

Grab Sampling

Grab samples will be collected in 125ml sterile containers midstream at the stations when ISCO discrete sampling is not practical due to dye traveling too fast to set an ISCO up at a station.

ISCO Discrete Samplers

ISCO discrete samplers will be setup to collect samples at a fixed station every 30 minutes. The unit will pull in an aliquot of 400 ml every 30 minutes into a precleaned discrete sample. The ISCO will be setup for each sample to initially flush old water out of the tubing until air bubbles are seen at the intake, then pull in the sample then flush out the remaining water in the line until air bubbles are seen at the intake line in the river. Bottles will be pre-labeled for analysis once the initial time of the ISCO sampling is determined. Field crews will service the ISCO by replacing containers with precleaned bottles and removing samples in the discrete base and analyzing them with a fluorometer on site. Sampling times maybe adjusted based on river flows.

Data Storage

Fluorometry data will be stored in field logbooks along with station number, time of collection, date and time of analysis. GPS data will be stored in the unit until post processing occurs back in the office.

Rhodamine WT Dye

Rhodamine dyes are highly fluorescent material with the unique ability to absorb green light and emit red light. Very few compounds have this property, so interference from other substances is very rare, making Rhodamine WT a highly specific tracer. The Turner Designs Model 10-AU-005 fluorometer is configured to shine green light on the sample and detect the red light emitted. The amount of red light emitted is directly proportional to the concentration of the dye, up to 100 parts per billion (100µg/l).

The Turner Designs 10-AU Fluorometer with Rhodamine WT dye forms a tracer system. The fluorometer is configured to selectively measure Rhodamine WT dye with minimal interference from background materials.

The background fluorescence in the river will be determined before the dye is injected at each of the eight stations by grabbing samples and running the samples in the discrete cell Fluorometer before dye is injected. Background fluorescence will be subtracted the total raw readings in the instrument. This will produce the final corrected readings used on the maps in the final report as well as in the field.

The instrument's portable and waterproof design allows on-site measurement in the field. The 10-AU Fluorometer with cuvette cell holder will directly measure dye samples in the field from grab samples.

Calibration will be conducted daily before field analysis with a 0.0 PPB standard and a 10 PPB standard. A check with a 1.0 PPB standard will be performed to determine the linearity of the calibration in the low range. A post analysis check will be conducted after all samples have been run using the 0.0 PPB standard and the 10 PPB standard. Deviations from the post analysis results will be checked to ensure the data quality is met in Table 4 that follows.

5.0 Field Sampling

Sampling Locations

Time-based samples will be collected every 30 minutes at predetermined fixed locations in Table 2. Field crews may need to adjust times based on flow in the river and extent of dye plume. The sampling depth will be generally 6" to 24" (15-60 cm) below the surface in the center of the channel in well-mixed areas. Sampling stations will be documented with GPS units. Sample location numbers correspond with the TMDL water quality study stations that were conducted by MEDEP. Maps of station locations are in Appendix A.

Table 2. Wilson Stream Sample Locations

Station Code	Location
Dye injection	River Meadow Golf Club @ river access
PR1	McGregor Bridge Sappi
PR2	Between Westbrook and SAPPi outfalls
PR3	Below Sappi (warehouse west bank)
PR4	Rte 302 Bridge
PR5	Above Meader Brook (powerlines east bank)
PR6	Blackstrep Rd
PR7	Rte 26
PR8	Maine Turnpike spur bridge
PR9	1/2 way inbetween Turnpike and Falls
PR10	Above Presumpscot Falls

Sample Collection

The sampling train will consist of intake Tygon tubing, ISCO discrete sampler with new silastic tubing. Water will be pulled from the river into the ISCO sampler for storage at 4°C until serviced into 125ml bottles for analysis. After samples have been distributed into bottles from the ISCO, the ISCO will be cleaned with soapy water, and three distilled water rinses so the ISCO can be put into service at the next site downstream without an ISCO. If Propak bottle setup is used then new bags will be used after each sample collection.

Field crews will grab multiple samples in 125ml bottles at 10 stations where an ISCO discrete sampler is not practical or necessary.

6.0 Interference and Potential Problems

Sampling will be attempted to be collected midstream of the station. Due to the width of the river it may be impractical to sample from center of channel at this point, the most representative flow area will be chosen by the field sampler. Every effort will be made to collect samples that are free of debris. The intake line will

be checked routinely to verify no clogging is occurring. In addition, grab samples should be collected up gradient of the sampler to avoid excessive mixing from the field personnel. If no sample is collected at in the discrete sampler, notations will be made in the logbook. As necessary, corrections will be made at a later date, based on the field log notations.

7.0 Sample Handling

A bound field notebook will be maintained by field personnel to record sample collection and relevant field operations. Dye concentrations will be collected every 30 minutes at each station until measurements are less than 20% of peak flow at each station.

When preparing the dye for dye injection, the dye will be diluted at a 1:4 ratio with river water from the respective dye release point in a pail. Dye will be handled with disposable gloves, protective eye wear and Tyvek suit to minimize spills in the field.

All samples for dye analysis for the Presumpscot River will be collected in 125 ml precleaned containers and analyzed within 7 days. These samples will be stored @ 4 °C in the darkness of a cooler until analysis within 7 days.

Gloves and safety glasses will be used for personal protection near locations of potential high bacteria sources, which includes areas immediately downstream of wastewater treatment plants.

8.0 Analytical Parameters

Table 3: Analytical References and QC Goals for Water

PARAMETER	Analytical Method Reference	Reporting Limits	Precision Goals	Accuracy Goals	Completeness Goals
Fluorometry	Turner Designs 10-AU Manual	0.1 PPB	±0.1PPB	±2 PPB *	80%

*=based on calibration standard of 10 PPB

9.0 Schedule of Task and Products

- | | |
|--|--------------------------|
| 1) Scoping Meeting | 8/11/08 |
| 2) Conduct Presumpscot River Dye Study | during low flow in 2008 |
| 3) Complete all analytical | two weeks after sampling |
| 4) Requested data reports submitted to MEDEP | 11/30/08 |

10.0 Field Safety

All field samplers will be approved by their immediate supervisors to perform fieldwork. The supervisors are responsible for assuring the field samplers are trained (OSHA 1910-120) in safety issues regarding fieldwork.

11.0 Data Quality Requirements and Assessments

Precision and Accuracy:

The precision and accuracy of the data shall fall within the ranges specified in Table 3 for QC goals and reporting limits.

Data Representativeness:

Samples must be representative of conditions existing at the time of sample collection. Standardized procedures will be used at all times in an effort to insure representativeness of conditions present at the site.

Data Comparability and Completeness:

Data must be comparable for all samples within each media, i.e. all analyzed with the same detection limits and method for each parameter. Standardized procedures will be used at all times in an effort to insure representativeness of conditions present at the site which allows for a higher level of comparability. Data will be compared with existing databases. Analytical methods will be those cited in the parameter tables. At least 80% of the data must be determined to be valid or useable for the project to be considered complete.

Data Validation and Usability:

All analytical results will be reviewed against the goals established in Table 3. The QC requirements will be evaluated by the primary field sampler and a second field sampler before they are released. Data reports will then be evaluated by the EPA project manager for usability in obtaining the stated objectives of the project.

Corrective Action:

When it is found that data is incomplete or that results are unacceptable, the Project Officer may determine that one or more of the following procedures for corrective action shall be undertaken:

Incomplete data:

Omissions from logs, notebooks and worksheets place the entire analysis in question. If data does not meet the 80% data completeness requirement, a meeting will be held with the EPA Project Officer and QA officer to determine an appropriate response. Incomplete field sampling data may require another dye injection on a different day. Resampling of the existing dye plume is not possible due to the plume is moving over time.

Conflicting or poor quality data:

When results from duplicates, blanks and post calibration standards do not meet the described QC goals, the project officer and QA officer will review the available data. Upon examination, all or some of the following actions may be applied:

- A. Systems audit for analyte in question.*
- B. Determination of matrix interference.*
- C. Re-sampling of the questionable sample.*
- D. Reconsideration of acceptable limits with statements explaining the results of the action/rationale taken.*
- E. Rejection of data and exclusion from the report with written explanation.*
- F. Rejection of the entire sample/site location with recommendation of relocation of sample site or reconsideration of results.*

12.0 Final Report

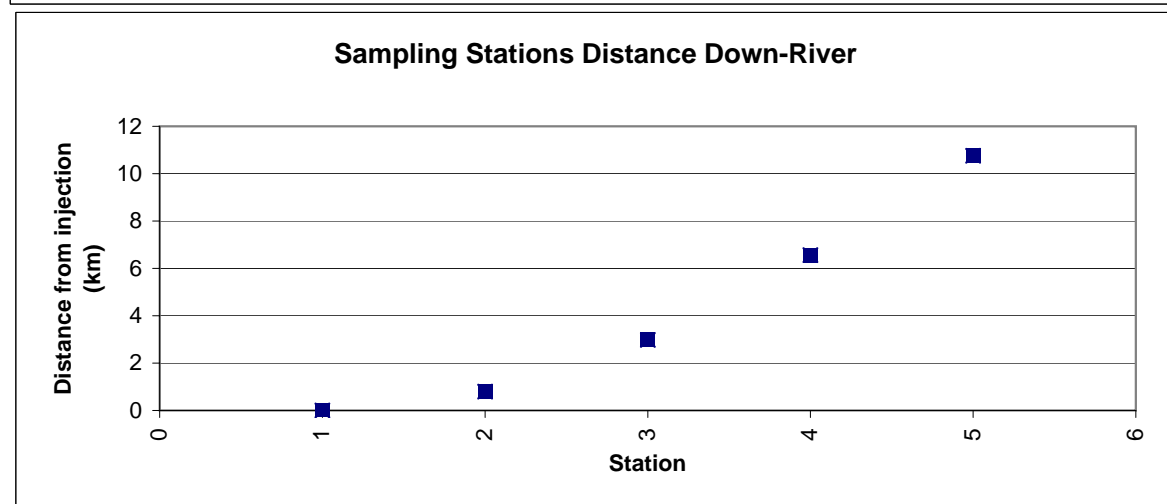
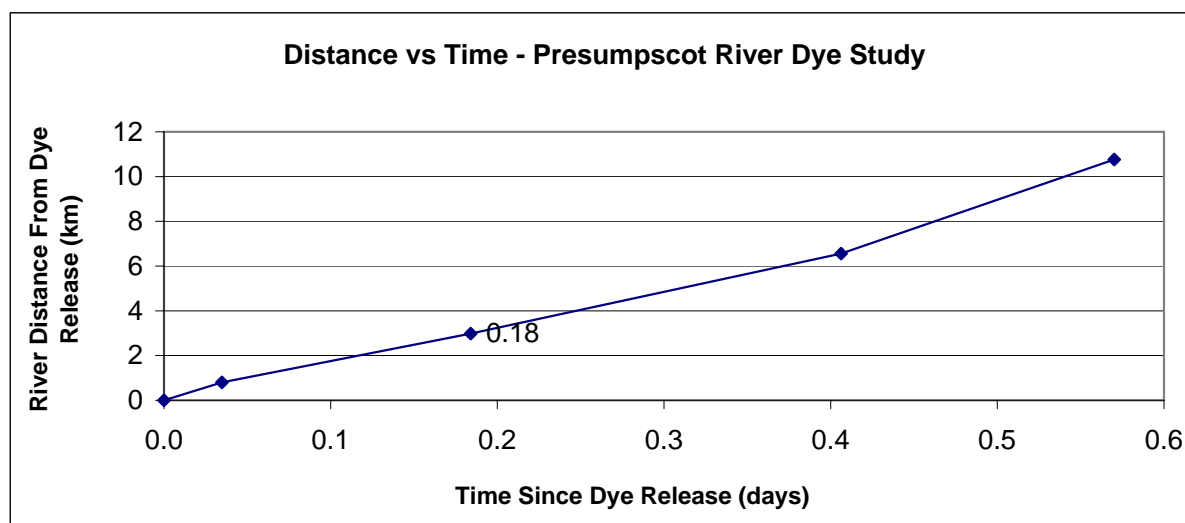
The final data report will be written by Tim Bridges of EPA, OEME, ECA for the Presumpscot River Dye Study. All analytical results will be included with the examination of all fluorometry at each station. The data will be compared at each station showing time of travel for leading edge, peak flow and 20% of peak trailing edge. Dispersion and dilution patterns will be drawn out on GIS maps produced by OEME. The final data report will be written by EPA and delivered to Don Albert, MEDEP, TMDL coordinator.

13.0 Reconciliation with Project Goals

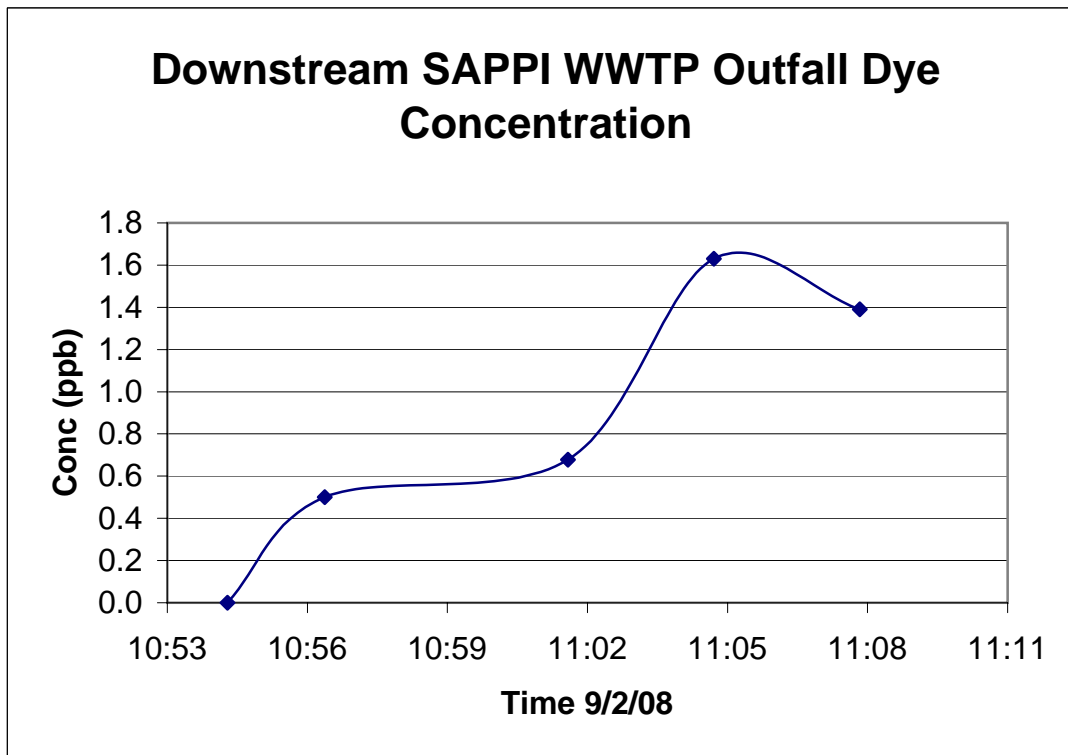
The data collected during this dye study is to be used to aid in determining the dispersion and time of travel of Presumpscot River during low flow conditions. The data is also intended for development of a TMDL model for better understanding of river hydrodynamics during low flow conditions. If these project goals are met, the study will be successful and complete.

Station	River Distance kilometers	Time of peak	Time since release days	hours	Velocity km/hr	Velocity mi/hr	Velocity ft/sec	
PR3	0.00	9/2/08 10:15	0.00					
WWTP	0.80	9/2/08 11:05	0.03	0.83	0.96	0.60	0.88	
PR4	2.98	9/2/08 14:40	0.18	4.42	0.67	0.42	0.62	*
PR6	6.56	9/2/08 20:00	0.41	9.75	0.65	0.40	0.59	
PR10	10.76	9/2/08 23:56	0.57	13.68	0.84	0.52	0.77	*

* = data was interpreted due to lack of samples at this site to determine peak flow.

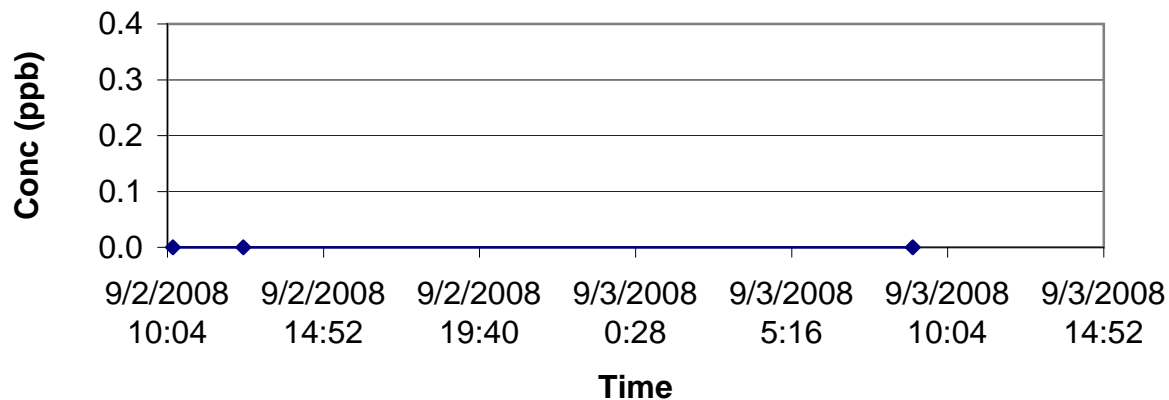


Station	Time of collect (EDT)	Measured Conc (ppb)	Dilution 1:xx	Actual Conc (ppb)	Comments
WWTP	9/2/08 10:55	0.00		0.00	
WWTP	9/2/08 10:57	0.50		0.50	
WWTP	9/2/08 11:02	0.68		0.68	
WWTP	9/2/08 11:05	1.63		1.63	peak
WWTP	9/2/08 11:08	1.39		1.39	



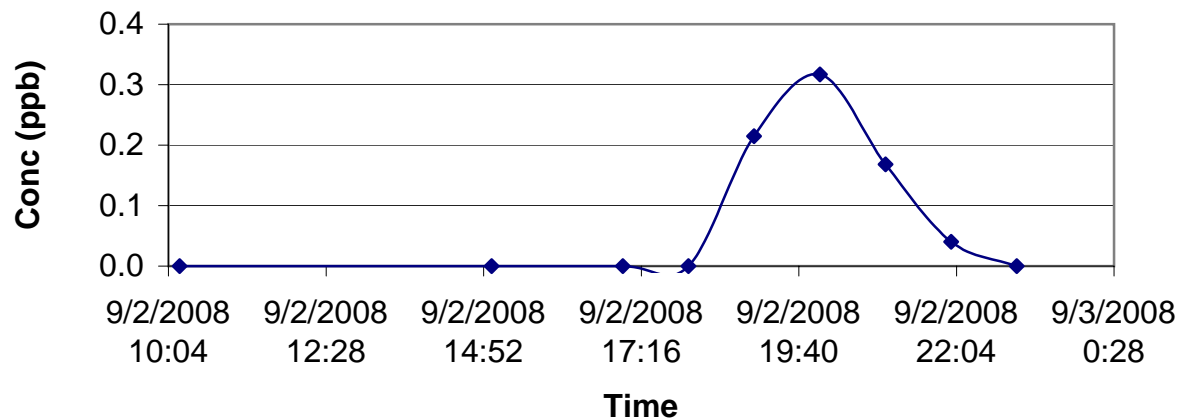
Station	Time of collect (EDT)	Measured Conc (ppb)	Dilution 1:xx	Actual Conc (ppb)	Comments
PR4	9/2/08 10:15	0.00		0.00	
PR4	9/2/08 12:25	0.00		0.00	
PR4	9/3/08 9:00	0.00		0.00	

PR4 Route 302 Crossing Dye Concentration



Station	Time of collect (EDT)	Measured Conc (ppb)	Dilution 1:xx	Actual Conc (ppb)	Comments
PR6	9/2/08 10:15	0.00		0.00	
PR6	9/2/08 15:00	0.00		0.00	
PR6	9/2/08 17:00	0.00		0.00	
PR6	9/2/08 18:00	0.00		0.00	
PR6	9/2/08 19:00	0.22		0.22	leading edge peak
PR6	9/2/08 20:00	0.32		0.32	
PR6	9/2/08 21:00	0.17		0.17	
PR6	9/2/08 22:00	0.04		0.04	
PR6	9/2/08 23:00	0.00		0.00	

PR6 Blackstrap Road Crossing



Station	Time of collect	Measured Conc	Dilution	Actual Conc	Comments
	(EDT)	(ppb)	1:xx	(ppb)	
PR10	9/2/08 15:00	0.00		0.00	
PR10	9/3/08 11:45	0.00		0.00	

